PATENT APPLICATION

Backup Processing Method

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BACKUP PROCESSING METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to a backup processing system to back up the data of data processing systems executing on-line processing and batch processing and more particularly to a technology effectively applicable to backup processing systems capable of preventing the backup processing from being prolonged when trouble occurs during backup processing.

2. Description of the Related Art

On-line processing and batch processing in data processing systems of banks, securities firms, etc., sometimes come to an abnormal end due to bugs in programs, trouble with storage devices, etc., leaving data in an inconsistent state. Data are sometimes erased by human errors made by persons engaging in data processing. Known in order to restore data processing systems in such trouble are several means for correcting such inconsistencies in such data and starting such data processing again or redoing such data processing from scratch. With one of the means, a data processing system is restored by backing up data from

time to time and restoring the data if trouble has occurred.

With the means for backing up and restoring data, data of, for example, a database system are backed up regularly into a storage medium such as a magnetic tape. If trouble occurs in the database system, the data are restored from the magnetic tape to the storage device of the database system and the backup system dates back to an appropriate point in time to reconstruct the data in the storage device of the database system. Thus the data of the database system are restored so that the database processing can be started again.

In the case of batch processing, the data of the storage device of the system are backed up into a magnetic tape prior to batch processing. If batch processing comes to an abnormal end, the data are restored from the magnetic tape to the storage device and then batch processing is started again from scratch.

Disclosed in JP-A-242437/2000 is a storage-device system which makes a copy of data to be backed up in its storage device so that backup data can be made not from the data, but from the copy; therefore access to the data in the storage device is not disturbed even while the data are being backed up.

While data are being backed up into a magnetic tape by the means for backing up and restoring data described

above, backup processing sometimes comes to an abnormal end due to trouble with the magnetic-tape drive or the magnetic tape. In this case, another magnetic-tape drive and another magnetic tape have to be prepared and the data-backup processing has to be redone from scratch. Thus the data-backup processing takes a long time.

Recently data in the data processing systems have been increasing rapidly, increasing the amount of data which need to be backed up. On the other hand, to minimize the effects of data-backup processing on on-line business affairs, time allowed for data-backup processing has been shortening. If data-backup processing of a system comes to an abnormal end, the data-backup processing has to be redone from scratch; thus data-backup processing takes a long time not to be finished in the allowed time for backup processing, affecting the on-line business affairs.

In the case of the storage-device system of JP-A-242437/2000, the effects of data-backup processing coming to an abnormal end on the on-line business affairs can be lessened. However, if data-backup processing comes to an abnormal end, it has to be redone from scratch; accordingly it takes a long time to complete the data-backup processing, the processing occupying resources such as magnetic-tape drives and data-transfer routes for a long time.

SUMMARY OF THE INVENTION

In accordance with the above, the object of the present invention is to provide a technology capable of preventing the backup processing from being prolonged when trouble occurs during backup processing.

According to the present invention, resources and routes necessary for backup processing are dynamically secured to form a plurality of backup subsystems in a backup processing system for backing up the data of a data-processing computer system and backup processing are executed by the subsystems

In the backup processing system of the present invention, the states of a plurality of resources such as backup servers, library devices, etc. necessary for data-backup processing are managed, resources in a usable state are selected from the managed resources, and switches in a usable state are selected from a plurality of switches necessary for forming routes among the selected resources.

Then it is checked whether resources and routes for forming a plurality of backup processing subsystems are secured or not. If resources and routes for forming a plurality of backup processing subsystems are secured, backup processing is executed by using the secured resources

and routes.

The backup processing described above is executed by using a plurality of resources and routes so secured. When the backup processing has been successfully executed by at least one subsystem, the backup processing is regarded as success. Alternatively, data may be backed up by at least one subsystem, and if trouble occurs during the backup processing, it is continued by using other resources and routes.

As described above, in the backup processing system according to the present invention, resources and routes necessary for backing up data to be used by a data-processing computer system are dynamically secured to form a plurality of backup subsystems, and backup processing is executed; therefore the backup processing is prevented from being prolonged when trouble occurs during backup processing.

Other and further objects, features and advantages of the invention will appear more fully from the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred form of the present invention illustrated in the accompanying drawings in which:

Fig. 1 is a schematic block diagram of an embodiment

of backup processing system of the present invention;

Fig. 2 shows an example of the backup processing information 410 held by the backup manager 400;

Fig. 3 shows an example of backup server information 420;

Fig. 4 shows an example of library device information 430;

Fig. 5 shows an example of tape information 440 held by the backup manager 400;

Fig. 6 shows an example of FC switch information 450;

Fig. 7 is a flowchart of backup processing by backup manager 400;

Fig. 8 shows the rest of the back up processing by the backup manager 400;

Fig. 9 shows an example of backup data save information 460;

Fig. 10 is a flowchart of restore processing by backup manager 400;

Fig. 11 is a flowchart of backup processing by backup manager 400;

Fig. 12 shows the rest of the backup processing by the backup manager 400; and

Fig. 13 is an example of the copy device information 470 held by the backup manager 400.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, a preferred embodiment of backup processing system of the present invention will be described.

Referring to Fig. 1, the backup processing system is provided with a backup manager 400, which has a resource selection processor 401, a route selection processor 402, a backup processor 403, and a restore processor 404.

The resource selection processor 401 selects resources in a usable state from a plurality of resources such as backup servers 300, library devices 500, tapes 510, etc. necessary for the backup of data to be used in data processing by a host computer 100.

The route selection processor 402 selects FC (Fibre Channel) switches 600 in a usable state from a plurality of FC switches 600 for forming routes among the selected resources. When resources and routes necessary for backing up data to be used in data processing by the host computer 100 are secured to form a plurality of backup subsystems, the backup processor 403 executes backup processes, using the selected resources and routes.

The restore processor 404 finds storage areas of backup data by using information relating backup data to their storage areas and restores data into a storage device

200 of the host computer 100.

A program to have the backup manager 400 function as the resource selection processor 401, the route selection processor 402, the backup processor 403, and the restore processor 404 is recorded in a storage medium such as a CD-ROM, stored in a magnetic disk or the like, and then loaded in a memory and executed. The program may be recorded in storage media other than the CD-ROM. The program may be installed from the storage medium of the program into a data processing device to use the program, or the storage medium of the program may be accessed through a network to use the program.

The backup processing system comprises the host computer 100 , the storage device 200, the backup servers 300, the backup manager 400, the library devices 500, fibre-channel switching devices, or FC switches, 600, and copy devices 610 which take copies of data in the host computer 100 in accordance with backup instructions.

The host computer 100, the backup servers 300, the backup manager 400, and the FC switches 600 are connected by a network 800. The host computer 100, the storage device 200, the backup servers 300, the backup manager 400, the library devices 500, and the copy devices 610 consist of the FC switches 600 and connected by a SAN (Storage Area Network) 700 for data transfer.

The host computer 100 has a backup agent 110 which controls the application software and database-management software of the host computer 100 for backup processing. The storage device 200 has a function to record and reproduce data to be used by the host computer 100 in accordance with requirements by the host computer 100. A single magnetic-disc drive, a magnetic disk drive-cum-controller of a RAID (Redundant Array of Inexpensive Disks) type, or the like may be used as the storage device 200.

Each library device 500 has a plurality of tapes 510 and reads data from and writes data into a tape 510, which is selected by external control, in accordance with read and write demands by a device connected to said library device 500. In data-backup processing to be described later, the library devices 500 store copies (backup data) of the data which are stored in the storage device 200 and used by the host computer 100.

The host computer 100, the backup servers 300, and the backup manager 400 have components such as memories and CPUs necessary for computers, but for them to have such components is not important for the present embodiment; therefore the details of such components will not be described here.

In the data-backup processing to be described below, the backup manager 400 accomplishes the backup of the data

stored in the storage device 200 within a given time in accordance with a schedule by securing multiple resources necessary for backup processing and instructing the backup servers 300 so secured to execute the backup.

Referring to Fig. 2, an example of backup processing information 410 held by the backup manager 400 will be described. "Process Number" means numbers allotted to backup processes. "Time" means the time and the date when each backup process is started. Held in the "Object" column is information to identify the data in the storage device 200 to be backed up. The information may be information identifying logical or physical volumes, file names (identifiers), database table names (identifiers), or the like.

The backup manager 400 holds various pieces of information shown in Figs. 3 to 6 to manage the various resources mentioned above.

Referring to Fig. 3, an example of backup server information 420 will be described. The numbers in the column of "Server Number" identify the backup servers 300. Held in the column of "Server Name" are the names (identifiers) of the backup servers 300. Held in the column of "State" is the state of each backup server 300; i.e. usable, in use, or unusable. When a backup server 300 is executing a backup process in accordance with a data set in the backup

processing information 410, the process number in the data set is held in the column of "Process Number." Numbers in the column of "Stream Number" distinguish the multiple copies, to be made as described later, of data in a backup process.

Referring to Fig. 4, an example of library device information 430 will be described. The numbers in the column of "Library Device Number" identify the library devices 500. The codes (identifiers) in the column of "Library Device Name" identify the library devices 500. The columns of "State," "Process Number," and "Stream Number" hold the relation between the library devices 500 and backup processes as in the case of the backup server information 420.

Referring to Fig. 5, an example of tape information 440 held by the backup manager 400 about tapes 510 in each library device 500 will be described. The backup manager 400 has the tape information 440 on each library. The numbers in the column of "Tape Number" of the tape information 440 of each library device 500 identify the tapes 510 of said library device 500. The columns of "State," "Process Number," and "Stream Number" hold the relation between the tapes 510 and backup processes as in the case of the backup server information 420.

Referring to Fig. 6, an example of FC switch

information 450 will be described. The numbers in the column of "FC Switch Number" identify the FC switches 600. The codes (identifiers) in the column of "FC Switch Name" identify the FC switches 600. The columns of "State," "Process Number," and "Stream Number" hold the relation between the FC switches 600 and backup processes as in the case of the backup server information 420.

Referring to Figs. 7 and 8, backup processing by the backup manager 400 will be described.

The backup manager 400 commences a backup process of the data specified by a backup data set in the backup processing information 410 at the time on the date given by the backup data set (Step 1000). The backup manager 400 instructs the backup agent 110 of the host computer 100 to prepare the backup (Step 1010).

The resource selection processor 401 of the backup manager 400 selects a backup server 300 from usable backup servers 300 by using the backup server information 420, changes the state information of the selected backup server 300 from "usable" to "in use", sets the process number of the selected backup server 300 to the same number as the process number in the backup data set in the backup processing information 410, and sets the stream number of the selected backup servers 300 to "0" (Step 1020). The selected backup server 300 will hereinafter be called backup

server "0".

In the similar way, the resource selection processor 401 of the backup manager 400 selects a library device 500 usable for the backup process and a tape 510 in the library device 500 usable for the backup process by using the library device information 430 and the tape information 440, changes the state information of the selected library device 500 and tape 510 from "usable" to "in use," sets the process numbers of the selected library device 500 and tape 510 to the same number as the process number in the backup data set in the backup processing information 410, and sets the stream numbers of the selected library device 500 and tape 510 to "0" (Step 1030). The selected library device 500 and tape 510 will hereinafter be called library device "0" and tape "0", respectively.

The route selection processor 402 of the backup manager 400 selects an FC switch 600 to form the routes among the storage device 200, the backup server "0", and the library device "0" by using the FC switch information 450, changes the state information of the selected FC switch 600 from "usable" to "in use", sets the process number of the selected FC switch 600 to the same number as the process number in the backup data set in the backup processing information 410, and sets the stream number of the selected FC switch 600 to "0" (Step 1040).

Then the route selection processor 402 of the backup manager 400 selects another backup servers 300, another library device 500, another tape 510, and another FC switch 600 in the same way as described above, but all given a stream number "1", to secure another backup route, or subsystem (Steps 1050 to 1070). The backup server 300, the library device 500, and the tape 510 so selected will hereinafter be called backup server "1", library device "1", and tape "1", respectively.

If the resource selection processor 401 and the route selection processor 402 fail to secure two backup routes, or subsystems, as described above, the backup processor 403 of the backup manager 400 regards the backup process as failure, releases the secured resources, and records the failure in a log (Steps 1180 and 1190). Besides, the backup processor 403 may notify the user of the failure.

If two backup routes, or subsystems, are secured, the backup processor 403 of the backup manager 400 controls the library device "0" to prepare the recording of the data into the tape "0" (Step 1090).

Then the backup processor 403 of the backup manager 400 notifies the backup server "0" of the data to be backed up, the library device "0", and the tape "0" and instructs the backup server "0" to back up the data into the tape "0" (Step 1100).

The backup server "0" reads out the data to be backed up from the storage device 200, transfers the data to the library device "0", and writes the data into the tape "0". When the backup process has been finished successfully, the backup server "0" notifies the backup processor 403 of the successful completion of the backup process. If the backup process comes to an abnormal end, the backup server "0" notifies the backup processor 403 of the abnormal end (Step 1110).

While the above backup process is being executed, the backup processor 403 of the backup manager 400 prepares the library device "1" and instructs the backup server "1" to back up the data into the tape "1". As in the case of the backup process described above, the backup server "1" executes the backup process and notifies the backup processor 403 of the result of the backup process (Steps 1120 to 1140).

The backup processor 403 of the backup manager 400 receives the information on the results of backup processes from the backup servers "0" and "1" and checks the contents of the information to judge the backup processes to be success or failure. If both the backup processes are failure, the backup of the data is regarded as failure (Steps 1180 and 1190). If either of the backup processes is successful, the backup of the data is regarded as success and the backup

processor 403 of the backup manager 400 finds the storage area of the data so backed up, or backup data, and updates the backup data save information 460 (Step 1160).

Referring to Fig. 9, an example of the backup data save information 460 will be described. Field in the "Object" column identifies backuped data and includes information to distinguish logical or physical volumes, file names (identifiers), database table names (identifiers), etc. "Start Time" means the time and the date when a backup process of data was started. "End Time" means the time and the date when the backup process of the data was ended. "Data Time" means the time and the date of the data as backup data. "Library Device Number" and "Tape Number" mean the numbers of a library device 500 and a tape 510 in which the backup data were stored, corresponding to "Library Device Number" in the library device information 430 and "Tape Number" in the tape information 440, respectively. Held in the "Data Position" column is information on the storage area of the backup data on the tape 510; for example, block addresses or the number of bytes of an offset from the head. "Data Size" is the size of the backup data in, for example, the number of blocks or bytes.

If one of the above two backup processes is successful, the backup processor 403 of the backup manager 400 records, into the backup data save information 460, the numbers of

the library device 500 and the tape 510 in which the data have successfully been stored. If two or more backup processes are successful, the numbers of the library device 500 and the tape 510 of either of the backup processes or the numbers of the library devices 500 and the tapes 510 of two or more backup processes are recorded in the backup data save information 460. The storage areas of the backup data on both the tapes 510 or the storage area of the backup data on either tape 510 is also recorded in the backup data save information 460. For example, backup results of the first successful process only can be selected.

The backup processor 403 of the backup manager 400 stores all or part of the information on each tape 510 in the backup data save information 460 into said tape 510 (Step 1170) and can collect the information from said tape 510 as the need arises.

The backup processor 403 of the backup manager 400 changes the state of the backup server information 420, the library device information 430, the tape information 440, and the FC switch information 450 all used for the backup processes from "in use" to "usable", namely, releases resources secured for the backup processes and completes them (Step 1190).

Referring to Fig. 10, the procedure of the restore process by the backup manager 400 will be described. If data

stored in the storage device 200 are lost due to trouble with some device or operational trouble, the user checks with the restore processor 404 of the backup manager 400 about the situation of backup data (Step 2000).

The restore processor 404 of the backup manager 400 presents information on the backup data to the user by using the backup data save information 460 (Step 2010).

The user chooses data to be restored, appoints a storage area for restoring in the storage device 200, and instructs the restore processor 404 of the backup manager 400 to restore the data (Step 2020).

Using the backup data save information 460, the restore processor 404 of the backup manager 400 specifies the library device 500 and the tape 510 storing data to be restored and its storage area on the tape, refers to the library device information 430 and the tape information 440, makes sure that the state of the library device 500 and the tape 510 are "usable" and changes the state of the library device 500 and the tape 510 to "in use" (Step 2030).

Also, using the backup server information 420, the restore processor 404 of the backup manager 400 selects a backup server 300 to be used for restoring from "usable" backup servers 300, and changes the state of the backup server information 420 of the selected backup server 300 from "usable" to "in use" (Step 2040). Further, the restore

processor 404 selects a FC switch 600 to form the routes among the library device 500, the selected backup server 300 and the storage device 200, and changes the state information of the selected FC switch 600 to "in use" in the FC switch information 450 (Step 2050).

Then the restore processor 404 of the backup manager 400 controls the library device 500, and prepares so that data to be restored can be obtained from the tape 510 (Step 2060).

Then the restore processor 404 of the backup manager 400 notifies the selected backup server 300 of the library device 500, the tape 510, data to be restored, its storage area on the tape and area to which it is restored, and instructs the backup server 300 to restore the data to be restored (Step 2070).

Upon receiving the instruction, the backup server 300 reads out data to be restored from the tape 510 of the library device 500, and restores the data on the appointed storage area of the storage device 200 (Step 2080).

When the instructed restore process has been finished successfully, the backup server 300 notifies the restore processor 404 of the successful completion of the restore process. If the restore process comes to an abnormal end, the backup server 300 notifies the restore processor 404 of the abnormal end (Step 2090).

The restore processor 404 of the backup manager 400 records in a log and notifies the user of the success when the notice is a successful completion, and the failure when the notice is an abnormal end, respectively (Step 2100).

The restore processor 404 of the backup manager 400 changes the state of various information for the restore process from "in use" to "usable", namely, releases the resources so secured and completes the restore process (Step 2110).

As described above, in the backup processing system according to the present embodiment, resources and routes necessary for backing up data to be used by a host computer 100 are dynamically secured as required to form a plurality of backup subsystems, and backup processing are executed in parallel by the plurality of backup subsystems. Therefore, even when trouble occurs during any of the plurality of backup processing, such backup processing is prevented from being prolonged and the backup processing can be completed within a given time.

In the backup processing described above, the backup is executed in parallel by a plurality of backup servers 300. In the backup processing referring to Figs. 11 and 12 below, however, the copy device 610 making copies of data for the backup is switched when trouble occurs.

Fig. 11 is a flowchart of back up processing by backup

manager 400 of the present embodiment.

Fig. 12 is a flowchart showing the rest of the backup processing by the backup manager 400 of the present embodiment. As in the processing described above, a resource selection processor 401 of the backup manager 400 starting backup processing, by using copy device information 470, selects a copy device 610 to be used for the backup processing from usable copy devices 610 and sets copy device information 470 (Step 3000).

The selected copy device 610 will hereafter be called copy device "0". The selection of the copy device "0" and setting to the copy device information 470 made by the backup manager 400 are the same as what are done to the backup server 300 and the backup server information 420 in the previously described backup processing.

Fig. 13 is an example of the copy device information 470 held by the backup manager 400 of the present embodiment. The numbers in the column of "Copy Device Number" identify the copy device 610. Held in the column of "Copy Device Name" are the names (identifiers) of the copy device 610. The state, process numbers and stream numbers are the same as those of the backup server information 420.

Further, as in the process described above, the backup manager 400 selects the library device "0", the tape "0", the copy device "1", the library device "1", the tape "1"

and the FC switch 600, and secures the selected equipment (resources) by setting various information (Step 3010). If the backup manager 400 fails to secure two or more backup routes, or subsystems, as in the above process, the backup manager 400 regards the backup process as failure (Step 3160), and releases the resources secured for the backup process (Step 3170).

Then the backup processor 403 of the backup manager 400 controls the library device "0" and the library device "1" to prepare the recording of the data into the tape "0" and the tape "1" (Step 3030, 3040).

Then the backup processor 403 of the backup manager 400 instructs the copy device "0" to backup (copy) the data to be backed up into the tape "0" of the library device "0" (Step 3050). As an example of backup directive commands instructing the copy, there is an EXTENDED COPY command specified in SCSI (Small Computer System Interface). When using EXTENDED COPY commands, copying can be instructed by specifying a device from which data is copied, a device to which data is copied, an address of the area from which data is copied, an address of the area to which data is copied and copy length, etc. as parameters.

The backup processor 403 of the backup manager 400 executes copying of the data to be backed up by dividing it into a plurality of processes with a plurality of EXTENDED

COPY commands. If the data to be copied, for example, is of the size of 100 Mbytes, a copy length is set as 10 Mbytes each by 10 commands, and the copying process is repeated 10 times. By dividing the copy process, fine-particle size by command during a troubleshooting procedure can be realized. Further, a prompt troubleshooting is given and the backup process can be continued.

The copy device "0" executes the instructed copy process, and informs the backup processor 403 successful completion when the copy process is successfully completed and an abnormal end when the copy process comes to an abnormal end (Step 3060).

Upon receiving a report of the successful completion, the backup processor 403 of the backup manager 400 records, with respect to the data whose copy process is successfully completed, the library device "0", the tape "0" and storage area of data on the tape in the backup data save information 460 (Step 3080). When there is data which has not been copied yet, the backup processor 403 issues the next copy command to the copy device "0" (Step 3090). When the whole copy process of data to be backed up is completed, the backup process is regarded as successful (Step 3150) and resources secured for the backup process is released (Step 3170).

When receiving a report of abnormal end of copy process from the copy device "0" or reaching a time-out

without receiving any reports from the copy device "0", the backup processor 403 of the backup manager 400 indicates, with respect to data whose copy process has not successfully completed, the copy device "1" to copy to the tape "1" of the library device "1" (Step 3100).

The copy device "1" executes the instructed copy process and, as described above, informs copy results to the backup processor 403 of the backup manager 400 (Step 3110).

When receiving a report of successful completion, the backup processor 403 stores, with respect to the data whose copy has been successfully completed, the library device "1", the tape "1" and the storage area of data on the tape into the backup data save information 460 (Step 3130). If there is data which has not been copied yet, the backup processor issues the next copy instruction command to the copy device "1" (Step 3140).

When the whole copy process of data to be backed up is completed, the backup process is regarded as successful (Step 3150) and resources secured for the backup process is released (Step 3170). When receiving a report of abnormal end of the copy process from the copy device "1" or reaching a time-out, the backup process is regarded as failure (Step 3160) and resources secured for the backup process is released (Step 3170).

When switching of the backup processes as described

above occurs, the backup data is divided into a plurality of sections and stored in the two or more library devices 500 and the tapes 510. Such sections of the backup data and their storage area are respectively recorded in the backup data save information 460 and managed. Namely, the backup data save information 460 may have entries of a plurality of storage areas with respect to backup data of given data to be backed up.

As described in the above restore process, when the backup manager 400 restores data, it requests, by using the backup data save information 460, the presentation of the restorable data and storage area of data to be restored. When the backup data (data to be restored) is divided and stored, as described above, however, the restore processor 404 of the backup manager 400 obtains, by using the backup data save information 460, each storage area (the tape 510 of the library device 500). The restore processor 404 then sequentially secures, gives a restore instruction to the backup server 300 or to the copy device 610 and releases so as to restore all the data to be restored.

As previously described, in the backup processing system of the present embodiment, resources and routes necessary for backing up data to be used by a host computer 100 are dynamically secured according to each state to form a plurality of backup subsystems. Therefore, when trouble

occurs during any of the plurality of backup processing, the backup processing is continued in another system and such backup processing is prevented from being prolonged and can be completed within a given time.

In the above backup processing, the backup is started by the instruction of a user and according to the date and time set by the backup process information 410. Also, the user may give an instruction to start the backup.

Further, the FC switch 600 may have a zoning function grouping a plurality of ports owned by the FC switch 600 and allowing access and transfer within each group. Accordingly, in selecting and securing resources (routes) described in the above backup processing and restore processing, the backup manager 400 sets the FC switch 600 via a network 800, executes zoning the selected route as an independent route and carries out the processing so that the data transfer in the backup processing or the restore processing does not influence a transfer in processing by another computer and is not influenced by such transfer.

In both of the above described backup processing, two resources (routes) are secured and the processing is made. However, in order to improve the trouble-preventive function, three or more routes may be used to carry out the processing.

In the above backup processing and restore processing,

when data to be backed up or restored are files or database tables, the backup manager 400 and the backup server 300 have means to translate file management information of file systems and database management information.

Further, the backup processing method described above can be applied when creating a copy (snapshot) of data by the storage device 200 and acquiring the backup with respect to the copy.

In the above description, the host computer 100, the backup server 300 and the backup manager 400 are regarded as different computers. However, one or more computers may have means and functions of the above computers, and carries out the backup processing in the same way as described above.

In the former backup processing described above, the backup manager 400 manages various information and carries out the backup processing by using the backup server 300. However, as an example of alternative configuration, each backup server 300 may manage while synchronizing the information so that contents will be the same on each backup server 300, and achieve the backup processing by carrying out the processing previously done by the backup manager 400 in the above description.

Also, in the description of the latter backup process, the routes are switched according to an abnormal end of the EXTENDED COPY command. However, routes may be switched by

using other transfer instruction methods, for example, such as according to abnormal ends of data transfer based on a block, a track or a cylinder of the storage device 200 as a unit.

Further, in the above description, the storage area of the backup data is on the tape 510 of the library device 500. However, it may be other storage device such as a single magnetic disk unit or a magnetic disk unit with a controller having RAID configuration, etc.

As described above, according to the backup processing system of the present embodiment, resources and routes necessary for backing up data to be used by a data-processing computer system are dynamically secured to form a plurality of backup subsystems, and backup processing is executed; therefore the backup processing is prevented from being prolonged when trouble occurs during backup processing.

According to the present invention, resources and routes necessary for backup processing are dynamically secured to form a plurality of backup subsystems in a backup processing system for backing up the data of a data-processing computer system and backup processing are executed by the subsystems. Therefore, the backup processing is prevented from being prolonged when trouble occurs during backup processing.

The foregoing invention has been described in terms of preferred embodiments. However, those skilled, in the art will recognize that many variations of such embodiments exist. Such variations are intended to be within the scope of the present invention and the appended claims.